Data from the downhole array in the CaMI FRS Geophysical Observation Well

Malcolm B Bertram, Don C Lawton, Kevin W Hall and Kevin L Bertram
bertram@ucalgary.ca

The Containment and Monitoring Institute Field Research Station near Brooks, AB has several different sensor systems deployed is different configurations. Shown here is some data from the three component geophones installed in the Observation Well #2 at 5m spacing over an interval from 310m to 195m. The sensors are Geospace 32-CT 10Hz elements.

The data presented here is from a survey conducted in May 2017 utilizing the University of Calgary EnviroVibe and an accelerated weight drop using a nitrogen spring as the drive element. This source can be rotated to 45 degrees on either side to produce shear wave energy.

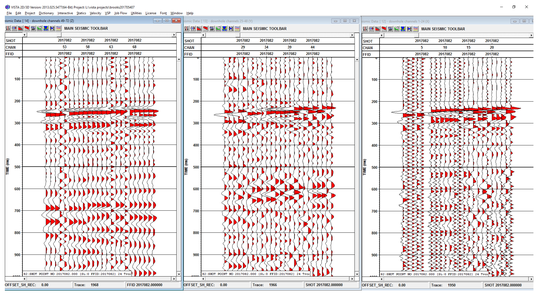
Because the geophones were not oriented on installation, it was necessary to rotate the data into H1 and H2 before processing. There were two rotations done, one from a source point at the NE end of the trench at an offset of 510m; the other from a source point on a source line perpendicular to the trench at an offset of 190m. The two were compared to check on consistency of the rotation algorithm (Vista VSP tool).

U of C EnviroVibe

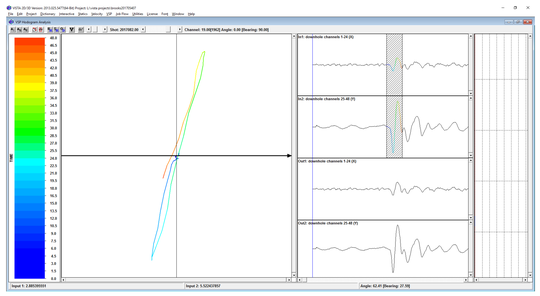
Accelerated weight drop

EnviroVibe data and rotation

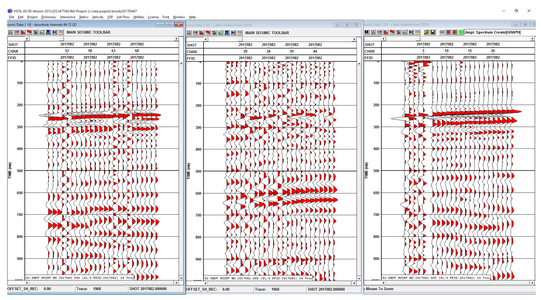
The rotation was first done on the shot at 13210 which is NE of the observation well with an offset of 510m.



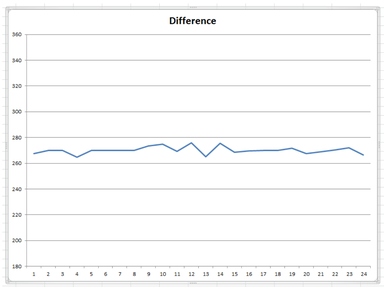
Raw shot gather for vibe point 13210



Snapshot of Vista VSP tool used for rotation

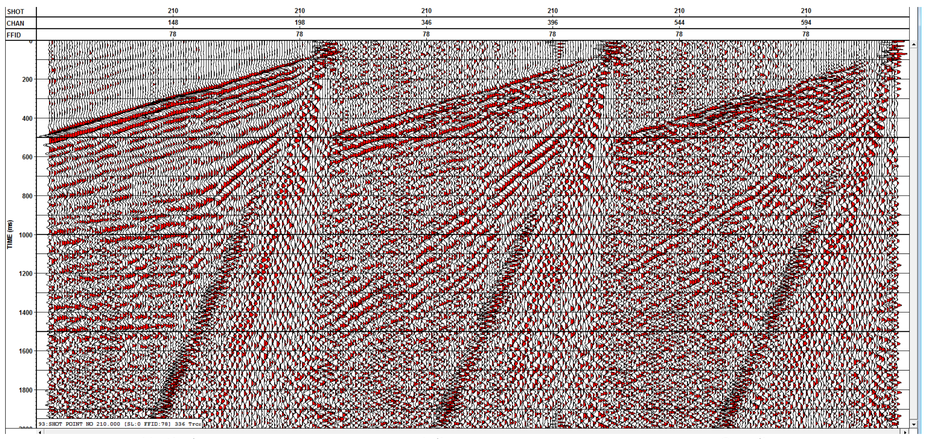


Rotated shot gather for vibe point 13210



Angle difference between the two separate rotations

A second rotation was then done on the shot at 15178 which is NW of the observation well with an offset of 190m. The comparison of the two separate rotation picks is shown in the Difference plot above. Because some of the elements were dead and not available for the pick, these were set to 270 for the plot. Apart from these there is good agreement for the two processes.

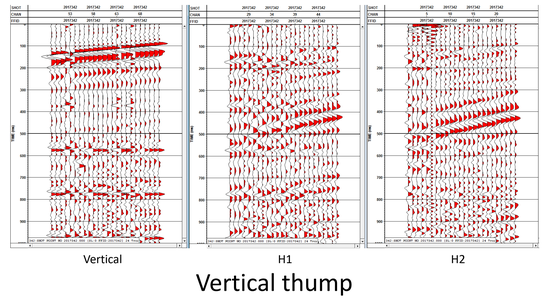


Shot point 13210 recorded on an Aries 3C surface spread along the trench

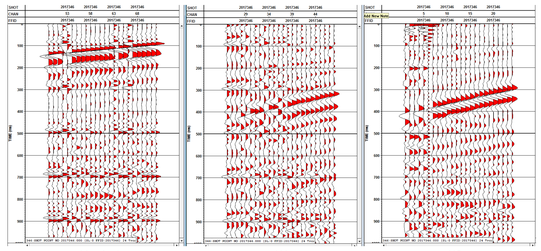
Thumper data

All the thumper data shown here has been rotated using the EnviroVibe records as shown in the other panel.

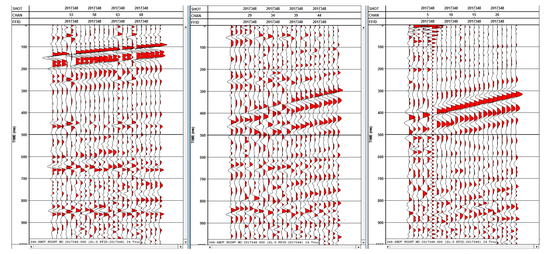
The data shown here is from a shotpoint at zero offset from the geophysical observation well where these geophones are installed. To separate the shear and P-wave energy the two opposite directions of thump are added (for P-wave) and subtracted (for shear). At the bottom of the panel is an example of the data shown after subtraction to enhance the shear wave energy. This shows that H1 is oriented east-west while H2 is north-south.



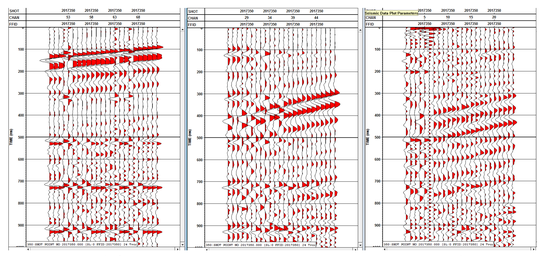
Vertical thump



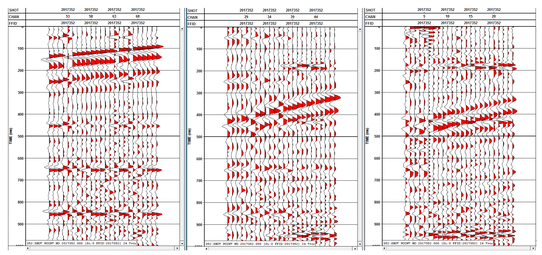
Thump to north



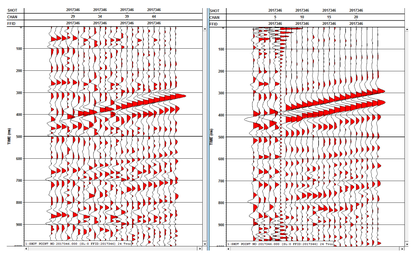
Thump to south



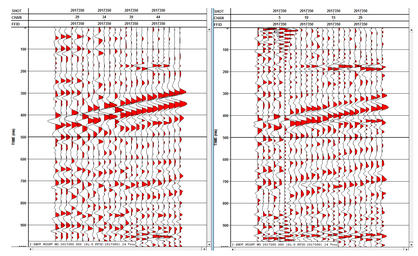
Thump to west



Thump to east



North - south



West - east

CREWES www.crewes.org

NSERC CRSNG

CMC Containment & Monitoring Institute

UNIVERSITY OF CALGARY
FACULTY OF SCIENCE
Department of Geoscience